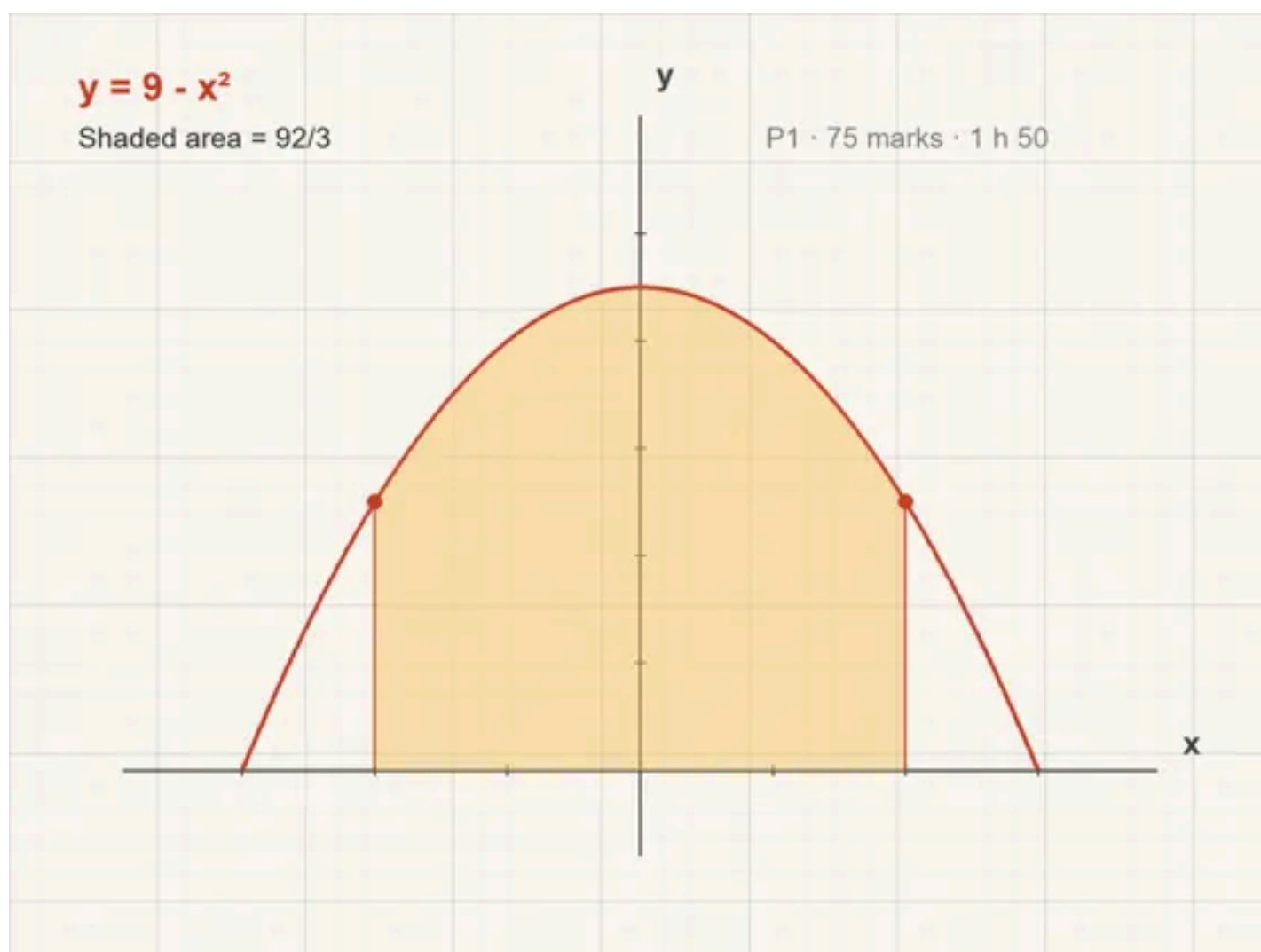


Cambridge A Level Mathematics 9709 Paper 1 Mock Paper — 75 marks, 1 h 50, with Full Worked Solutions

TutorZone (www.tutorzone.com.hk) 原創模擬試題 · 非考评局官方試題

Quick answer: Cambridge International AS & A Level Mathematics (9709) is made up of six papers, and A Level candidates sit **four**: **Paper 1 (Pure Mathematics 1) — 1 h 50, 75 marks** and **Paper 3 (Pure Mathematics 3) — 1 h 50, 75 marks** are compulsory, plus either **Paper 4 (Mechanics) + Paper 5 (Probability & Statistics 1)** or **Paper 5 + Paper 6 (Probability & Statistics 2)**. **Papers 4 and 6 cannot be combined**, because Paper 6 depends on Paper 5. Paper 1 is worth 60% of the AS Level and 30% of the A Level, so it is the foundation paper of the whole qualification. A scientific calculator is **required** in every paper; graphical calculators and calculators with symbolic manipulation are **not permitted**. The MF19 list of formulae and statistical tables is provided in the examination.



A typical Paper 1 spread: calculus, coordinate geometry and trigonometry dominate the paper, and method marks matter more than the final number.

Assessment at a glance: Cambridge AS & A Level Mathematics 9709 (2026 and 2027 series)

Paper	Component	Duration	Marks	Format	Weighting (AS / A Level)	Status
Paper 1	Pure Mathematics 1	1 h 50	75	10–12 structured questions	AS 60% / A Level 30%	Compulsory for AS and A Level
Paper 2	Pure Mathematics 2	1 h 15	50	6–8 structured questions	AS 40%	AS only (pure-mathematics route)
Paper 3	Pure Mathematics 3	1 h 50	75	9–11 structured questions	A Level 30%	Compulsory for A Level
Paper 4	Mechanics	1 h 15	50	6–8 structured questions	AS 40% / A Level 20%	Optional (see routes)
Paper 5	Probability & Statistics 1	1 h 15	50	6–8 structured questions	AS 40% / A Level 20%	Compulsory for A Level
Paper 6	Probability & Statistics 2	1 h 15	50	6–8 structured questions	A Level 20%	Optional (A Level only)

All six components are written examinations, externally assessed, with **no coursework**. AS Level grades run a–e; A Level grades run **A*–E**. Assessment-objective weightings: AO1 knowledge and understanding — AS 55% / A Level 52%; AO2 application and communication — AS 45% / A Level 48%.

The four rules candidates most often get wrong: ① A Level candidates **must** take Paper 1 and Paper 3 — an AS result alone cannot be upgraded; ② the AS pure-mathematics route (Paper 1 + Paper 2) **cannot** be carried forward to complete the A Level, because Paper 2 is an AS-only paper whose content is largely a subset of Paper 3; ③ **Papers 4 and 6 cannot be combined** (Paper 6 requires the prior knowledge of Paper 5); ④ Paper 2 and Paper 3 **may not be taken in the same series**.

The three routes, and how to choose components

Route	Combination	Notes
AS Level (one year)	Paper 1 + Paper 2	Pure mathematics only; cannot count towards the A Level
	Paper 1 + Paper 4	Pure mathematics + mechanics
	Paper 1 + Paper 5	Pure mathematics + probability & statistics
A Level (single series)	Paper 1 + Paper 3 + Paper 4 + Paper 5	The most common combination in Hong Kong (pure, mechanics, statistics)
	Paper 1 + Paper 3 + Paper 5 + Paper 6	Pure mathematics with statistics deepened — useful for data, economics or psychology

Route	Combination	Notes
A Level (staged)	Year 1: P1 + P4, Year 2: P3 + P5	Take the AS components first and carry the result forward, then complete two more components in a later series (within the carry-forward time limits)
	Year 1: P1 + P5, Year 2: P3 + P4	
	Year 1: P1 + P5, Year 2: P3 + P6	

Choosing components: engineering, physics or actuarial science applicants should almost always take Paper 4; economics, business, psychology or data-science applicants get more mileage from Paper 5 with Paper 6. If your school leaves the choice open, **Paper 1 + Paper 3 + Paper 4 + Paper 5** is the safest default and also supports progression to Further Mathematics (9231).

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How this paper was written — and copyright

This mock paper was written by the TutorZone tutor team against the assessment structure and subject content published in the *Cambridge International AS & A Level Mathematics 9709* syllabus for examinations in 2026 and 2027 (version 4; the 2028–2030 version was checked and the assessment structure is unchanged). It is **not** an official Cambridge question paper, specimen paper or past paper. Cambridge and its syllabus documents remain the copyright of Cambridge Assessment International Education, and no official paper or syllabus content is reproduced here. Every question, solution and marking point is original, **every numerical answer has been recalculated and verified**, and the mark allocation per question is our own (the paper totals the official 75 marks, with the official 1 h 50 duration).

04

Paper 1 mock paper (Pure Mathematics 1, 75 marks, 1 h 50)

Instructions: a scientific calculator is permitted (**graphical** calculators and calculators with symbolic algebra, differentiation or integration are **not**); bring a ruler — a protractor and compasses are not required. Unless told otherwise, angles are in degrees and non-exact answers should be given to 3 significant figures. **Section A (6 questions, 37 marks)** and **Section B (6 questions, 38 marks)**; show all working.

- 1.** (a) Expand and simplify $(3 + \sqrt{2})(5 - 2\sqrt{2})$, giving your answer in the form $a + b\sqrt{2}$ where a and b are integers. (2 marks)
- (b) Express $1/(3 - \sqrt{2})$ in the form $(a + b\sqrt{2})/c$, where a , b and c are integers. (2 marks)
- (c) Solve the equation $x - 6\sqrt{x} + 8 = 0$. (2 marks)
- 2.** The curve $y = 2x^2 - 12x + 7$ is given.
- (a) Express y in the completed-square form $a(x + b)^2 + c$. (2 marks)
- (b) State the coordinates of the minimum point and the minimum value of y . (2 marks)
- (c) Solve $2x^2 - 12x + 7 = 0$, giving your answers in surd form. (2 marks)
- 3.** The functions f and g are defined by $f(x) = (x + 4)/3$ for $x \in \mathbb{R}$ and $g(x) = x^2 - 6x + 5$ for $x \geq 3$.
- (a) Find $f^{-1}(x)$. (2 marks)
- (b) Write $g(x)$ in completed-square form and state the range of g . (2 marks)
- (c) Find $g^{-1}(x)$ and its domain. (2 marks)
- 4.** The circle C has equation $x^2 + y^2 - 8x + 6y - 24 = 0$.
- (a) Find the centre and radius of C . (3 marks)
- (b) Show that the point $P(11, -3)$ lies on C . (1 mark)
- (c) Find the equation of the tangent to C at P . (2 marks)
- 5.** The sector OAB has radius 6 cm and angle $\angle AOB = 1.2$ radians.
- (a) Find the length of the arc AB and the perimeter of the sector. (2 marks)
- (b) Find the area of the sector OAB . (2 marks)
- (c) Find the area of the segment, giving your answer to 3 significant figures. (2 marks)
- 6.** (a) Solve the equation $2\sin^2\theta + 3\cos\theta - 3 = 0$ for $0^\circ \leq \theta \leq 360^\circ$. (4 marks)
- (b) Express $3\sin\theta + 4\cos\theta$ in the form $R \sin(\theta + \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$, and hence state the maximum value of $3\sin\theta + 4\cos\theta$. (3 marks)

Section B (6 questions, 38 marks)

- 7.** (a) The third term of an arithmetic progression is 11 and the eighth term is 31. Find the first term a and the common difference d . (3 marks)
(b) Find the sum of the first 20 terms. (2 marks)
(c) A geometric progression has first term 24 and sum to infinity 60. Find the common ratio r . (2 marks)
- 8.** (a) Expand $(2 - x/4)^6$, giving the first three terms in ascending powers of x . (3 marks)
(b) Hence find the coefficient of x^2 in the expansion of $(1 + 2x)(2 - x/4)^6$. (3 marks)
- 9.** (a) Given $y = (2x - 5)^7$, find dy/dx . (2 marks)
(b) Given $y = (3x + 1)/(x - 2)$, find dy/dx . (2 marks)
(c) The curve $y = x^3 - 4x + 1$ is given. Find the equation of the tangent to the curve at the point where $x = 2$. (3 marks)
- 10.** (a) Find the coordinates of the stationary points of the curve $y = x^3 - 3x^2 - 9x + 5$ and determine the nature of each. (4 marks)
(b) A 40 m length of fencing encloses a rectangular garden, with one side formed by a wall that needs no fencing. Find the maximum area that can be enclosed and the corresponding width. (3 marks)
- 11.** (a) Evaluate $\int_1^3 (2x + 3) dx$. (2 marks)
(b) Find the area enclosed between the curve $y = 9 - x^2$ and the x -axis from $x = -2$ to $x = 2$. (2 marks)
(c) The curve $y = x^2$ for $x = 0$ to $x = 3$ is rotated through 360° about the x -axis. Find the volume of the solid formed, in terms of π . (2 marks)
- 12.** (a) Solve the simultaneous equations $y = x + 2$ and $y = x^2 - 4$. (3 marks)
(b) Solve the inequality $x^2 - 5x + 4 \geq 0$. (2 marks)

Paper 1 answers and marking points

- 1. (a) 2 marks:** expansion = $15 - 6\sqrt{2} + 5\sqrt{2} - 4$ (1); **11** - $\sqrt{2}$ (1). **(b) 2 marks:** multiply numerator and denominator by $(3 + \sqrt{2})$ (1); **$(3 + \sqrt{2})/7$** (1). **(c) 2 marks:** let $u = \sqrt{x}$, so $u^2 - 6u + 8 = 0$, giving $u = 2$ or 4 (1); **$x = 4$ or $x = 16$** (1). *Jumping straight to the answer without stating the substitution forfeits the method mark.*
- 2. (a) 2 marks:** $2(x^2 - 6x) + 7 = 2[(x - 3)^2 - 9] + 7$ (1); **$y = 2(x - 3)^2 - 11$** (1). **(b) 2 marks:** minimum point **(3, -11)** (1); minimum value **-11** (1). **(c) 2 marks:** $2(x - 3)^2 = 11$, so $(x - 3)^2 = 11/2$ (1); **$x = 3 \pm \sqrt{22/2} \approx 5.35$ or 0.65** (1).
- 3. (a) 2 marks:** $y = (x + 4)/3 \Rightarrow x = 3y - 4$, so **$f^{-1}(x) = 3x - 4$** (2). **(b) 2 marks:** **$g(x) = (x - 3)^2 - 4$** (1); since $x \geq 3$, the range is **$g(x) \geq -4$** (1). **(c) 2 marks:** $y = (x - 3)^2 - 4 \Rightarrow x - 3 = \pm\sqrt{y + 4}$ (1); **$g^{-1}(x) = 3 + \sqrt{x + 4}$ with domain $x \geq -4$** (1). *The negative root is rejected because the domain of g is $x \geq 3$.*
- 4. (a) 3 marks:** complete the square: $(x - 4)^2 + (y + 3)^2 = 24 + 16 + 9 = 49$ (2); centre **(4, -3)**, radius **7** (1). **(b) 1 mark:** $(11 - 4)^2 + (-3 + 3)^2 = 49$, so the distance equals the radius and P lies on C. (The squared-distance comparison must be shown.) **(c) 2 marks:** the centre and P lie on the same horizontal line, so the radius is horizontal and the tangent is vertical (1); **$x = 11$** (1).
- 5. (a) 2 marks:** arc length = $6 \times 1.2 = 7.2$ cm (1); perimeter = $7.2 + 6 + 6 = 19.2$ cm (1). **(b) 2 marks:** $\frac{1}{2} \times 6^2 \times 1.2 = 21.6$ cm² (2). **(c) 2 marks:** triangle area = $\frac{1}{2} \times 6^2 \times \sin 1.2 = 16.7767$ (1); segment = $21.6 - 16.7767 = 4.82$ cm² (1).
- 6. (a) 4 marks:** use $\sin^2\theta = 1 - \cos^2\theta$ to get $2\cos^2\theta - 3\cos\theta + 1 = 0$ (2); $(2\cos\theta - 1)(\cos\theta - 1) = 0$, so $\cos\theta = 1/2$ or 1 (1); **$\theta = 0^\circ, 60^\circ, 300^\circ, 360^\circ$** (1). *Giving only 60° and 300° loses the final mark.* **(b) 3 marks:** $R = \sqrt{3^2 + 4^2} = 5$ (1); $\tan \alpha = 4/3$ so $\alpha = 53.1^\circ$ (1); **$3\sin\theta + 4\cos\theta = 5 \sin(\theta + 53.1^\circ)$** , maximum value **5** (1).
- 7. (a) 3 marks:** $a + 2d = 11$ and $a + 7d = 31$ (1); subtracting gives $5d = 20$, so **$d = 4$** (1); $a = 11 - 2(4)$, so **$a = 3$** (1). **(b) 2 marks:** $S_{20} = 20/2 [2(3) + 19(4)] = 10(6 + 76)$ (1) = **820** (1). **(c) 2 marks:** $24/(1 - r) = 60$, so $1 - r = 0.4$ (1), giving **$r = 0.6$** (1; note that the sum-to-infinity formula requires $|r| < 1$).
- 8. (a) 3 marks:** $2^6 = 64$ (1); $6 \cdot 2^5 \cdot (-x/4) = -48x$ (1); $15 \cdot 2^4 \cdot (x/4)^2 = 15x^2$ (1), i.e. **$64 - 48x + 15x^2$** . **(b) 3 marks:** the x^2 term comes from $1 \times 15x^2$ and from $2x \times (-48x)$ (1); $15 + (-96)$ (1) = **-81** (1). *Writing only 15 and missing the cross term is the most common loss here.*
- 9. (a) 2 marks:** the chain rule gives $7(2x - 5)^6 \times 2$ (1) = **$14(2x - 5)^6$** (1). **(b) 2 marks:** the quotient rule gives $[(3)(x - 2) - (3x + 1)(1)]/(x - 2)^2$ (1) = **$-7/(x - 2)^2$** (1). **(c) 3 marks:** $y(2) = 8 - 8 + 1 = 1$ (1); $dy/dx = 3x^2 - 4$, so $m = 3(4) - 4 = 8$ (1); the tangent is **$y = 8x - 15$** (1).
- 10. (a) 4 marks:** $dy/dx = 3x^2 - 6x - 9 = 0 \Rightarrow x^2 - 2x - 3 = 0 \Rightarrow x = -1$ or 3 (1); $y(-1) = 10$ and $y(3) = -22$ (2); $y'' = 6x - 6$, so at $x = -1$, $y'' = -12 < 0$ giving a maximum at **(-1, 10)**, and at $x = 3$, $y'' = 12 > 0$ giving a minimum at **(3, -22)** (1). **(b) 3 marks:** let the two sides perpendicular to the wall each be x , so the side parallel to the wall is $40 - 2x$ (1); $A = x(40 - 2x)$ and $dA/dx = 40 - 4x = 0 \Rightarrow x = 10$ (1); $A = 10 \times 20 = 200$ m² (1; confirm the maximum with $d^2A/dx^2 = -4 < 0$).
- 11. (a) 2 marks:** $[x^2 + 3x]_1^3$ (1) = $(9 + 9) - (1 + 3) = 18 - 4 = 14$ (1). **(b) 2 marks:** $\int_{-2}^2 (9 - x^2) dx = [9x - x^3/3]_{-2}^2$ (1) = $(18 - 8/3) - (-18 + 8/3) = 92/3 \approx 30.7$ square units (1). **(c) 2 marks:** $V = \pi \int_0^3 (x^2)^2 dx = \pi[x^5/5]_0^3$ (1) = $243\pi/5 = 48.6\pi \approx 152.7$ cubic units (1). *Volume questions require $V = \pi \int y^2 dx$ before any marks are awarded for the method.*

12. (a) 3 marks: $x + 2 = x^2 - 4 \Rightarrow x^2 - x - 6 = 0$ (1); $(x - 3)(x + 2) = 0$, so $x = 3$ or $x = -2$ (1); the intersections are **(3, 5) and (-2, 0)** (1). **(b) 2 marks:** $(x - 1)(x - 4) \geq 0$ (1), so **$x \leq 1$ or $x \geq 4$** (1). *An answer of $1 \leq x \leq 4$ reverses the inequality and scores nothing.*

06

What Paper 1 covers — and what comes next

Paper 1 topic	What is examined
Quadratics	Completing the square, the discriminant, quadratic inequalities, simultaneous equations (line and curve)
Functions	Domain and range, composite functions, inverse functions, graph transformations
Coordinate geometry	Equations of lines and circles, intersections of a line and a circle, tangents and normals
Circular measure	Arc length, sector area, segment area
Trigonometry	Identities, solving trigonometric equations, expressing $a \sin \theta + b \cos \theta$ as $R \sin(\theta \pm \alpha)$
Series	Arithmetic and geometric progressions, sums to infinity, binomial expansion
Differentiation	Chain, product and quotient rules, tangents and normals, stationary points, rates of change
Integration	Indefinite and definite integrals, areas, volumes of revolution

- **Paper 3 adds:** logarithmic and exponential functions, further trigonometry, implicit and parametric differentiation, partial fractions, integration by parts, vectors (lines and planes), complex numbers and differential equations.
- **Paper 4 (Mechanics):** forces and equilibrium, kinematics in a straight line, momentum, Newton's laws of motion, energy, work and power.
- **Papers 5 and 6 (Probability & Statistics):** representation of data and summary statistics, permutations and combinations, probability, discrete random variables, the normal distribution; Paper 6 adds the Poisson distribution, linear combinations of random variables, continuous random variables, sampling and estimation, and hypothesis tests.

07

Where A Level Mathematics candidates lose marks

- **No stated method:** 9709 awards substantial method marks. Writing “using the quotient rule” or “let $u = \sqrt{x}$ ” earns marks on its own, and skipping that line loses marks even when the final answer is right.
- **Rounding too early:** the syllabus explicitly asks candidates to avoid rounding until the final answer. In segment areas and volumes of revolution, early 3-significant-figure rounding visibly shifts the final value.
- **Ignoring the domain:** an inverse function must be given with its domain, and when the original domain is $x \geq 3$ the negative root must be rejected. This is the single most common half-mark loss.
- **Missing roots of trigonometric equations:** $\cos \theta = 1/2$ has two roots in 0° – 360° and $\cos \theta = 1$ has two (0° and 360°). Every root must be listed.

- **Applying Paper 3 content:** logarithms, vectors, complex numbers and implicit differentiation belong to Paper 3 and **will not** appear in Paper 1 — reaching for them wastes time.
- **Non-compliant calculators:** graphical calculators and any calculator with symbolic manipulation are not permitted; check that your calculator is an approved scientific model before the exam.
- **Ignoring the required form:** if a question says “in terms of π ” or “to 3 significant figures”, follow it exactly, and write the correct units for area and volume (cm^2 , cm^3 , m^2).

08

12-week revision plan (built around Paper 1, covering the rest of the A Level)

Weeks	Content	Practice focus
1–2	Quadratics, functions and graph transformations	Completing the square and the discriminant in word problems; domains of inverse functions
3–4	Coordinate geometry (lines, circles, tangents), inequalities, simultaneous equations	The three cases of a line meeting a circle: two points, one point (tangent), none
5	Circular measure (arc, sector, segment)	Degrees–radians conversion; segment area
6–7	Trigonometry: identities, equations, $R \sin(\theta \pm \alpha)$	Timed equation solving — complete every root within 6 minutes
8	Series: arithmetic, geometric, binomial expansion	Condition for a sum to infinity; a named coefficient in an expansion
9–10	Differentiation: rules, tangents and normals, stationary points, rates of change	State the rule first; use the second derivative to classify each point
11	Integration: definite integrals, areas, volumes of revolution	Sketch to fix the limits; start volume questions with $V = \pi \int y^2 dx$
12	Timed Paper 1 (1 h 50, 75 marks)	About 1.5 minutes per mark, with the last 10 minutes spent checking missing roots and rounding

09

FAQ

How many papers do I sit for A Level Mathematics?

Four. Paper 1 and Paper 3 are compulsory, and then you take either (Paper 4 + Paper 5) or (Paper 5 + Paper 6). Papers 4 and 6 cannot be combined because Paper 6 depends on the prior knowledge in Paper 5.

Can I sit the AS Level only?

Yes — two components (Paper 1 plus one of Papers 2, 4 or 5), graded a–e. Note, however, that the **Paper 1 + Paper 2 pure-mathematics route cannot be carried forward to complete the A Level**; if you may want the full A Level later, take Paper 1 with Paper 4 or Paper 5 instead.

Are calculators allowed?

Yes, and a calculator with standard scientific functions is **required**. Computers, graphical calculators and calculators with symbolic algebra, differentiation or integration are not permitted. The MF19 list of formulae

and statistical tables is supplied, and you should bring your own ruler; a protractor and compasses are not required.

How is A* awarded?

A Level grades run A*–E. A* is not simply a total-mark threshold: candidates must achieve a high overall standard across the A Level components and reach a specified level in the two pure mathematics papers (Papers 1 and 3). Grade thresholds are published by Cambridge for each series — treat any tutoring-centre estimate with caution.

Where do Hong Kong candidates enter?

Cambridge examinations in Hong Kong are administered through the Hong Kong Examinations and Assessment Authority (HKEAA) as the examination centre, and candidates normally enter through their school or an examination centre. Check the HKEAA and Cambridge websites for entry deadlines, the June and November series and fees.

How does this mock paper differ from official material?

It is an original practice paper written against the published assessment structure. The questions, solutions and mark allocation are TutorZone's own and are not official questions, specimen papers or past papers. Use it alongside the official specimen papers.

Official sources

Source	What to use it for
Cambridge AS & A Level Mathematics 9709 syllabus (2026–2027, PDF)	Durations, marks, weightings, route combinations, calculator rules and the MF19 formula list
9709 syllabus (2028–2030, PDF)	Confirms that the assessment structure from 2028 onwards is unchanged
9709 subject page	Latest syllabus version, specimen papers and teaching resources
HKEAA — Cambridge examinations in Hong Kong	Entry, examination series and centre information for Hong Kong candidates

See also: [A Level Mathematics \(9709\) curriculum guide](#), [Cambridge IGCSE Mathematics 0580 mock paper](#), [IB Mathematics AA SL mock paper](#) and [exam practice questions](#). Looking for A Level Mathematics tuition? Start with the [subject guides](#) and then match with a tutor.